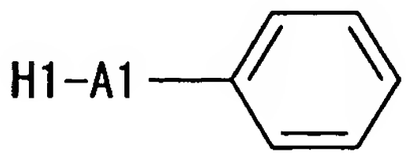
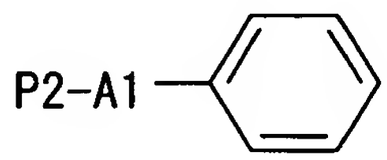
CLAIMS

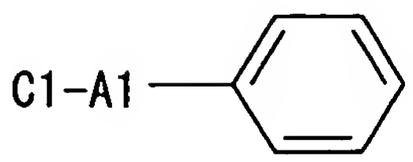
1. A method for producing a picolinic acid compound, which comprises reacting an aromatic compound that contains a phenyl group represented by the following formula (I), (II), or (III):



(I)



(II)

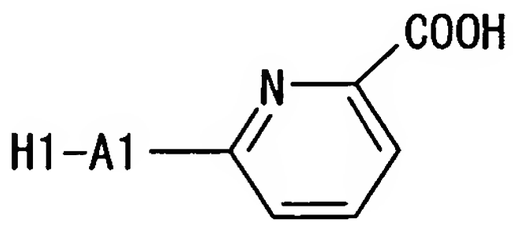


(III)

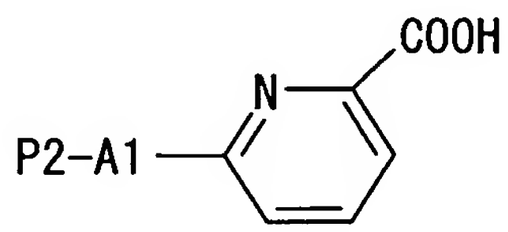
wherein, H1 is an optionally substituted heterocyclic group, A1 is a single bond or an optionally substituted $C_{1\text{-}4}$ alkylene group or alkenylene group, P2 is an optionally substituted phenyl group, and C1 is an optionally substituted cyclic hydrocarbon group (excluding a phenyl group), and where formula II does not represent diphenylacetylene

with aromatic ring dioxygenase, aromatic ring dihydrodiol dehydrogenase, and aromatic ring diol dioxygenase, and

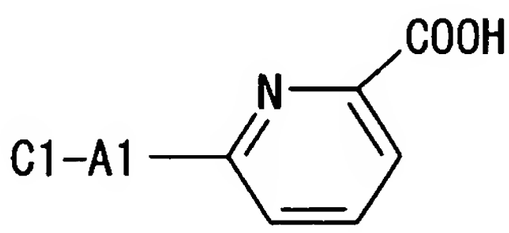
obtaining a picolinic acid compound (I'), (II'), or (III'):



(I')



(II')



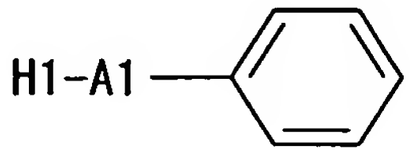
(III')

wherein H1, A1, P2, and C1 are as defined above.

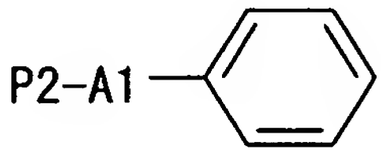
2. The method according to claim 1, wherein aromatic ring dioxygenase, aromatic ring dihydrodiol dehydrogenase, and aromatic ring diol dioxygenase are those derived from biphenyl-degrading bacteria or variants thereofor modified products obtained therefrom by molecular evolution engineering techniques.

3. A method for producing a picolinic acid compound, which comprises

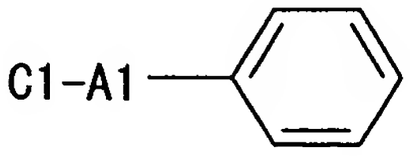
culturing a recombinant microorganism into which genes encoding aromatic ring dioxygenase, aromatic ring dihydrodiol dehydrogenase, and aromatic ring diol dioxygenase have been introduced in a medium containing a compound represented by the following formula (I), (II), or (III):



(I)



(II)

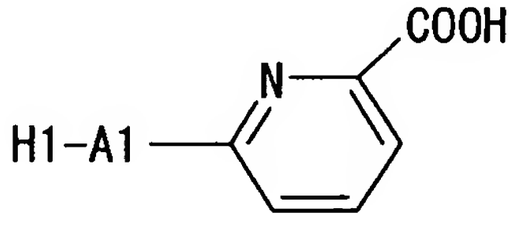


(III)

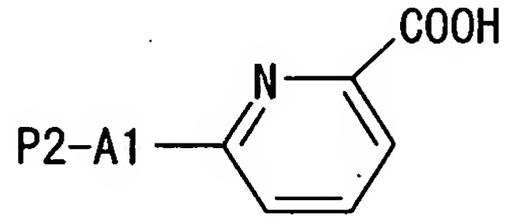
wherein H1 is an optionally substituted heterocyclic group, A1 is a single bond or an optionally substituted $C_{1\text{-}4}$ alkylene group or alkenylene group, P2 is an optionally substituted phenyl group, and C1 is an optionally substituted cyclic hydrocarbon group (excluding a phenyl group), and where the formula II does not represent diphenylacetylene

and

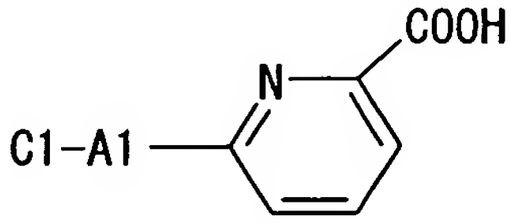
obtaining from the culture product or the microorganism a picolinic acid compound (I'), (II') or (III'):



(I')



(II')



(III')

wherein H1, A1, P2, and C1 are as defined above.

4. The method according to claim 3, wherein the genes encoding aromatic ring dioxygenase, aromatic ring dihydrodiol dehydrogenase, and aromatic ring diol dioxygenase are those derived from biphenyl-degrading bacteria or variants thereof or

modified products obtained therefrom by molecular evolution engineering techniques.

5. The method according to claim 3 or 4, wherein the recombinant microorganism is recombinant *Escherichia coli*.

6. The method according to any one of claims 1 to 5, wherein the compound represented by the formula (I), (II), or (III) is selected from the group consisting of flavanone, flavone, 6-hydroxyflavanone, 6-hydroxyflavone, 7-hydroxyflavanone, 2-phenylquinoline, 2-phenylbenzoxazole, biphenyl, (trans-)chalcone, 3-phenyl-1-indanone, and 2-phenylnaphthalene.

7. The method according to any one of claims 1 to 6, wherein a large subunit of aromatic ring dioxygenase is the following protein (a) or (b):

(a) a protein comprising the amino acid sequence shown in SEQ ID NO: 2; or

(b) a protein comprising a sequence derived from the amino acid sequence shown in SEQ ID NO: 2 by deletion, substitution, or addition of 1 or several amino acids and having functions of the large subunit of aromatic ring dioxygenase.

8. A protein (a) or (b) shown below:

(a) a protein comprising the amino acid sequence shown in SEQ ID NO: 2; or

(b) a protein comprising a sequence derived from the amino acid sequence shown in SEQ ID NO: 2 by deletion, substitution, or addition of 1 or several amino acids and having functions of a large subunit of aromatic ring dioxygenase.

9. A gene encoding the following protein (a) or (b):

(a) a protein comprising the amino acid sequence shown in SEQ ID NO: 2; or

(b) a protein comprising a sequence derived from the amino acid sequence

shown in SEQ ID NO: 2 by deletion, substitution, or addition of 1 or several amino acids and having functions of a large subunit of aromatic ring dioxygenase.

10. A gene comprising DNA consisting of the nucleotide sequence shown in SEQ ID NO: 1.